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     (FILE 'HOME' ENTERED AT 08:25:54 ON 30 JAN 2003)
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L1 374689 S MRS OR MAGNETIC RESONANCE OR NMR
L2    134 S L1(4A)(BREAST OR MAMMARY OR MAMMA)
L3    150 S L1(6A)(MALIGNANT OR BENIGN OR NODAL OR VASCULAR?)
L4  14970 S (DETECT? OR DETERMIN? OR MEASUR? OR MONITOR? OR TEST? OR CLASSIF? OR
          ANALY? OR ASSAY? OR ASSESS? OR EVALUAT? OR IDENTIF? OR
          EXAMIN?)(6A)(MALIGNANT OR BENIGN OR NODAL OR VASCULAR?)
L5    158 S L1 AND L4
L6   1371 S L1(6A)(CARCINOMA OR CANCER OR GROWTH OR LUMP OR TUMOR)
L7 171089 S (DETECT? OR DETERMIN? OR MEASUR? OR MONITOR? OR TEST? OR CLASSIF? OR
          ANALY? OR ASSAY? OR ASSESS? OR EVALUAT? OR IDENTIF? OR
          EXAMIN?)(6A)(CANCER OR GROWTH OR LUMP OR TUMOR OR CARCINOMA)
L8    643 S L1(10A)L7
L9    103 S L2 AND L3,L5,L6,L8
L10  1675 S L1 AND L7 AND(CARCINOMA OR CANCER OR GROWTH OR LUMP OR TUMOR)
L11    92 S L10 AND (SCS OR STATIST? OR ALGOR? OR MATHEMAT? OR COMPUTER?)
          E MOUNTFORD C/AU
L12    44 S E4,E6-7
          E RUSSELL P/AU
L13   467 S E3,E5,E8-9,E12-13,E17,E25-26,E68-78
          E SMITH I C/AU
L14    33 S E5
          E SMITH IAN/AU
L15   352 S E3,E10-11
          E SOMORJAI R/AU
L16    60 S E3-8
L17    28 S L12-16 AND L6
L18   218 S L9,L11,L17
L19   182 S L18 NOT PY>2000
     FILE 'BIOSIS' ENTERED AT 09:18:27 ON 30 JAN 2003
L20   592 S L19
L21    97 S L20 AND(BIOPSY OR VITRO OR EX SITU OR EX VIVO)
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L22  1125 S L19
L23   205 S L22 AND(BIOPSY OR VITRO OR EX SITU OR EX VIVO)
L24   164 S L23 AND(SCS OR STATIST? OR ALGOR? OR MATHEMAT? OR COMPUTER?)
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L25   373 DUP REM L19 L21 L24 (70 DUPLICATES REMOVED)

=> d l25 bib,ab 1-373

L25  ANSWER 14 OF 373  CA  COPYRIGHT 2003 ACS
AN   135:116624  CA
TI   The use of 1H-NMR spectroscopy for predicting the efficiency of neoadjuvant
     chemotherapy of breast cancer
AU   Semenova, N. A.; Dydykina, I. Yu.; Dederer, L. Yu.; Tikhomirov, A. G.;
     Gorbunova, V. A.; Laktionova, K. P.; Gorbacheva, L. B.
CS   Institute of Chemical Physics, Russian Academy of Sciences, Russia
SO   Bulletin of Experimental Biology and Medicine (Translation of Byulleten
     Eksperimental'noi Biologii i Meditsiny) (2000), 130(7), 701-704
AB   The pool of low-mol.-wt. metabolites was studied in patients with breast
     cancer by high-resoln. 1H-NMR spectroscopy.  In order to predict the
     efficiency of treatment, mathmetical regression anal. was carried out with
     consideration for some clin. morphol. characteristics of patients,
     chemotherapy protocols, and the degree of therapeutic pathomorphosis.  The
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efficiency of drug therapy was largely detd. by metabolic status of tumors in untreated patients with breast cancer.

L25 ANSWER 36 OF 373 CA COPYRIGHT 2003 ACS
AN 133:331635 CA
TI Distinction between normal and renal cell **carcinoma** kidney cortical biopsy samples using pattern recognition of 1H magic angle spinning (MAS) **NMR** spectra
AU Tate, A. Rosemary; Foxall, Peta J. D.; Holmes, Elaine; Moka, Detlef; Spraul, Manfred; Nicholson, Jeremy K.; Lindon, John C.
CS Biological Chemistry, Division of Biomedical Sciences, Imperial College School of Medicine, University of London, London, SW7 2AZ, UK
SO NMR in Biomedicine (2000), 13(2), 64-71
AB The technique of magic angle spinning (MAS) high resoln. 1H **NMR** spectroscopy applied to intact tissues provides excellent peak resoln. and thus much biochem. information. The use of **computer**-based pattern recognition techniques to classify human renal cortex tissue samples as normal or **tumor** based on their 1H MAS **NMR** spectra has been investigated. In this preliminary study of 22 paired control and **tumor** samples, exploratory data **anal**. using principal components based on **NMR** spectral intensities showed clear sepn. of the two classes. Furthermore, using the supervised method of linear discriminant anal., based on individual data point intensities or on integrated spectral regions, it was possible to distinguish between the normal and **tumor** kidney cortex tissue with 100% accuracy, including a single example of a metastatic **tumor** from a primary lung **carcinoma**. A **tumor** sample from the collecting duct of the kidney showed a different **NMR** spectral profile, and pattern recognition indicated that this sample did not **classify** with the cortical **tumors**.

L25 ANSWER 39 OF 373 CA COPYRIGHT 2003 ACS
AN 136:179967 CA
TI Malignancy of brain **tumors evaluated** by proton **magnetic resonance** spectroscopy (1H-**MRS**) in vitro
AU Czernicki, Z.; Horsztynski, D.; Jankowski, W.; Grieb, P.; Walecki, J.
CS Department of Neurosurgery, Medical Research Centre, Polish Academy of Sciences, Warsaw, Pol.
SO Brain Edema XI, Proceedings of the International Symposium, 11th, Newcastle-upon-Tyne, United Kingdom, June 6-10, 1999 (2000), Meeting Date 1999, 17-20. Editor(s): Mendelow, A. David. Publisher: Springer-Verlag Wien, Wien, Austria.
AB Biopsies of 6 malignant gliomas (grade 3 or 4) and 11 low-grade meningiomas were extd. with perchloric acid or methanol/water, and the fully-relaxed 1H-**MRS** spectra of the exts. contg. water-sol. metabolites and a concn. and chem. shift std. were recorded at 11.4 T. The resonance signals assigned to inositol (Ino), glycerophospho- and phosphocholine (GPC + PC), choline (Cho), creatine and phosphocreatine (Cr + PCr), glutamate (Glu), acetate (Ac), alanine (Ala) and lactate (Lac) were integrated, and analyzed by two methods. First, the concns. of the aforementioned substances in the bioptates were estd. from their resonance signals in the exts. Second, these signals were normalized to the Cr + PCr resonance signal. The Mann-Whitney U-test was used to verify **statistical** significance between the data sets obtained for gliomas and meningiomas. When the first method of anal. was used, the only difference was in the Ala concn., which in meningiomas was on av. 4 times higher than in gliomas. However, when the second method of anal. was applied, gliomas expressed lower normalized resonance signals of Ala and Glu (ranges not overlapping), Lac, as well as Ino and GPC + PC. In proton MR spectra of brain **tumor** tissue exts. contg. water sol. metabolites, the resonance signals normalized to that of total creatine may

provide a very good discrimination between malignant gliomas and low-grade meningiomas.

L25 ANSWER 40 OF 373 CA COPYRIGHT 2003 ACS
AN 132:120765 CA
TI Metabolite composition in breast **tumors examined** by proton nuclear **magnetic resonance** spectroscopy
AU Gribbestad, I. S.; Sitter, B.; Lundgren, S.; Krane, J.; Axelson, D.
CS SINTEF Unimed MR Center, Trondheim, N-7034, Norway
SO Anticancer Research (1999), 19(3A), 1737-1746
AB Background: In vivo characterization of breast tumors using proton (1H) MR spectroscopy relies upon in vitro interpretation of tissue samples. The present study has investigated metabolite compn. in exts. from breast tumors and non-involved breast tissue. Multivariate data anal. was used to determinate combinations of metabolites important for differentiation. Materials and Methods: Tumor and non-involved breast tissue were obtained from 16 patients undergoing surgical treatment. 1H NMR spectra of perchloric acid tissue exts. were obtained at a BRUKER Avance DRX600 spectrometer. The data was analyzed using principal component anal. and probabilistic neural networks. Results: Low levels of glucose and high content of choline compds. were dominant findings in the tumor spectra. Principal component loadings demonstrated this strong assocn. The spectra were correctly classified using neural network anal. Conclusions: Large differences in the metabolite compn. of breast tumors and surrounding breast tissues have been documented.

L25 ANSWER 82 OF 373 CA COPYRIGHT 2003 ACS
AN 130:248842 CA
TI Diagnosis of **cancer** in humans by 1H **NMR** of tissue biopsies
AU **Smith, Ian C. P.**; Blandford, Dorothea E.
CS Institute for Biodiagnostics, National Research Council Canada, Winnipeg, MB, R38 1Y6, Can.
SO Biochemistry and Cell Biology (1998), 76(2/3), 472-476
AB A review with many refs. We describe methodol. for the diagnosis of human cancer, at high levels of accuracy, sensitivity, and specificity, by 1H NMR of tissue biopsies. This method is made robust and accurate by careful specimen prepn., and by multivariate anal. of spectral data. Examples are presented for the diagnosis of cancer of the prostate gland and the ovary. The potential for use of these methods noninvasively, in vivo, is shown to be very pos.

L25 ANSWER 89 OF 373 CA COPYRIGHT 2003 ACS
AN 130:206809 CA
TI **Measurements** of human **breast cancer** using **magnetic resonance** spectroscopy: a review of clinical measurements and a report of localized 31P measurements of response to treatment
AU Leach, M. O.; Verrill, M.; Glaholm, J.; Smith, T. A. D.; Collins, D. J.; Payne, G. S.; Sharp, J. C.; Ronen, S. M.; McCready, V. R.; Powles, T. J.; Smith, I. E.
CS CRC Clinical Magnetic Resonance Research Group, Institute of Cancer Research and Royal Marsden NHS Trust, Surrey, SM2 5PT, UK
SO NMR in Biomedicine (1998), 11(7), 314-340
AB A review with 106 refs. A review of the literature showed that in human breast tumors, large signals from phosphomonoesters (PME) and phosphodiesters (PDE) are evident. In serial measurements in 19 patients with breast cancer, a decrease in PME was significantly assocd. with a stable or responding disease ($p = 0.017$), and an increase in PME was assocd. with disease progression. Ext. studies have shown PME to comprise

of phosphoethanolamine (PEth) and phosphocholine (PCho), with the PEth to PCho ratio ranging from 1.3 to 12. The PCho content of high grade tumors was found to be higher than low grade tumors. In some animal models, changes in PCho have been shown to correlate with indexes of cellular proliferation, and spheroid studies have shown a decrease in PCho content in spheroids with smaller growth fractions. A serial study of 25 patients with advanced primary breast tumors undergoing hormone, chemotherapy or radiotherapy treatments, showed that in this heterogeneous group there were significant changes in metabolites that were seen during the first 3 wk (range 2-4 wk) of treatment, that correlated with vol. change over this period, employed here as a measure of response. Changes in PME ($p = 0.003$), total phosphate (TP) ($p = 0.008$) and total nucleoside tri-phosphate (TNTP) ($p = 0.02$) over 3 (± 1) weeks were significantly assocd. with response, as were the levels of PME ($p<0.001$), PDE ($p = 0.01$), TP ($p = 0.001$) and TNTP ($p = 0.007$) at week 3 (± 1). PME at week 3 (± 1) was also significantly assocd. with the best vol. response to treatment ($p = 0.03$). A reproducibility anal. of results from the observation of normal breast metab. in four volunteers showed a mean coeff. of variation of 25%, after correcting for changes resulting from the menstrual cycle. Reproducibility studies in four patients with breast cancer showed a mean coeff. of variation of 33%, with the reproducibility being better in patients measured on different days (difference in TP was -6%) compared with those measured on the same day (difference in TP was -29%).

L25 ANSWER 96 OF 373 CA COPYRIGHT 2003 ACS
AN 130:63057 CA
TI **Evaluating** human breast ductal **carcinomas** with high-resolution magic-angle spinning proton **magnetic resonance** spectroscopy
AU Cheng, Leo Ling; Chang, I-Wen; Smith, Barbara L.; Gonzalez, R. Gilberto
CS Department of Pathology, NMR Center, Department of Radiology, Harvard Medical School, Massachusetts General Hospital, Boston, MA, 02129, USA
SO Journal of Magnetic Resonance (1998), 135(1), 194-202
AB We report the results of a study of human breast ductal carcinomas, conducted by using high resoln. magic angle spinning proton magnetic resonance spectroscopy (HRMAS 1HMRS). This recently developed spectroscopic technique can measure tissue metab. from intact pathol. specimens and identify tissue biochem. changes, which closely correspond to tumor in vivo state. This procedure objectively indicates diagnostic parameters, independent of the skill and experience of the investigator, and has the potential to reduce the sampling errors inherently assocd. with procedures of conventional histopathol. In this study, we measured 19 cases of female ductal carcinomas. Our results demonstrate that: (1) highly resolved spectra of intact specimens of human breast ductal carcinomas can be obtained; (2) carcinoma-free tissues and carcinomas are distinguishable by alterations in the intensities and the spin-spin relaxation time T2 of cellular metabolites; and (3) tumor metabolic markers, such as phosphocholine, lactate, and lipids, may correlate with the histopathol. grade detd. from evaluation of the adjacent specimen. Our results suggest that biochem. markers thus measured may function as a valuable adjunct to histopathol. to improve the accuracy of and reduce the time frame required for the diagnosis of human breast cancer. (c) 1998 Academic Press.

L25 ANSWER 112 OF 373 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1997:490064 BIOSIS
TI Pretreatment prediction of the chemotherapeutic response of human glioma cell cultures using nuclear **magnetic resonance** spectroscopy and artificial neural networks.

AU El-Deredy, Wael (1); Ashmore, Sally M.; Branston, Neil M.; Darling, John L.; Williams, Steven R.; Thomas, David G. T.
CS (1) Dep. Neurological Surg., Inst. Neurol., Queen Square, London WC1N 3BG UK
SO Cancer Research, (1997) Vol. 57, No. 19, pp. 4196-4199.
AB Both **tumor** metabolism and its response to cytotoxic drugs are intrinsic properties of **tumor** cells. It is therefore likely that there is a relationship between the two properties, however subtle and complex, wherein the metabolic characteristics of **tumor** cells can reflect the inherent response (resistance or sensitivity) of these cells to cytotoxic drugs. We used artificial neural network analysis to show that it is possible to distinguish, prior to treatment, between drug-resistant and drug-sensitive human glioma cell cultures from their metabolic profiles, as given by high-resolution proton nuclear **magnetic resonance** spectra of the cell extracts, and to predict their cellular response to the chemotherapeutic drug 1-(2-chloroethyl)-3-cyclobexyl-1-nitrosourea in **vitro**. The results suggest that neural network **analysis** of **tumor** nuclear **magnetic resonance** spectra has potential as a prognostic tool for determining treatment of gliomas, ultimately noninvasively, and may be used to provide information about the metabolic pathways involved in drug response that may be helpful in developing novel treatments for these **tumors**.

L25 ANSWER 113 OF 373 CA COPYRIGHT 2003 ACS
AN 127:245017 CA
TI The classification of benign and malignant human prostate tissue by multivariate analysis of 1H **magnetic resonance** spectra
AU Hahn, Per; Smith, Ian C. P.; Leboldus, Leonard; Littman, Charles; Somorjai, Ray L.; Bezabeh, Tedros
CS Institute for Biodiagnostics, National Research Council, Winnipeg, MB, R3B 1Y6, Can.
SO Cancer Research (1997), 57(16), 3398-3401
AB 1H **magnetic resonance** spectroscopy studies (360 MHz) were performed on specimens of benign (n = 66) and malignant (n = 21) human prostate tissue from 50 patients, and the spectral data were subjected to multivariate anal., specifically linear-discriminant anal. On the basis of histopathol. assessments, an overall classification accuracy of 96.6% was achieved, with a sensitivity of 100% and a specificity of 95.5% in **classifying** benign prostatic hyperplasia from prostatic **cancer**. Resonances due to citrate, glutamate, and taurine were among the six spectral subregions identified by our **algorithm** as having diagnostic potential. Significantly higher levels of citrate were obsd. in glandular than in stromal benign prostatic hyperplasia ($P < 0.05$). This method shows excellent promise for the possibility of in vivo assessment of prostate tissue by **magnetic resonance**.

L25 ANSWER 117 OF 373 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1997:351557 BIOSIS
TI Proton MR spectroscopy of squamous cell **carcinoma** of the extracranial head and neck: In **vitro** and in vivo studies.
AU Mukherji, Suresh K. (1); Schiro, Sharon; Castillo, Mauricio; Kwock, Lester; Muller, Keith E.; Blackstock, William
CS (1) Dep. Radiol., 3324 Infirmary CB 7510, University North Carolina Sch. Med., Chapel Hill, NC 27599 USA
SO AJNR, (1997) Vol. 18, No. 6, pp. 1057-1072.
AB PURPOSE: To determine the ability of in **vitro** one-dimensional and two-dimensional proton MR spectroscopy to help differentiate squamous cell **carcinoma** of the extracranial head and neck from normal tissues and to correlate the in **vitro** observations with clinical studies. METHODS: In

vitro 1-D and 2-D correlated proton MR spectroscopy (11 T) was performed in tissue specimens of squamous cell **carcinoma** of the head and neck (n = 19), in normal tissue (n = 13), in metastatic cervical lymph nodes (n = 3), and in a squamous cell **carcinoma** cell line. In vivo 1-D proton MR spectroscopy (1.5 T) was performed in patients with squamous cell **carcinoma** (n = 7) and in healthy volunteers (n = 7). The ratio of the areas under the choline (Cho) and creatine (Cr) resonances were calculated for 1-D proton MR spectra for the in **vitro** tissue studies and correlated with the in vivo studies. Data from in **vitro** 2-D correlated spectroscopy were analyzed for differences in the presence or absence of various metabolites in samples of **tumor** and normal tissue. **Statistical analysis** consisted of 2 times 2 factorial repeated measures analysis of variance (ANOVA), discriminate analysis, and chi-2 test. RESULTS: The mean in **vitro** 1-D proton MR spectroscopic Cho/Cr ratio was significantly higher in **tumor** than in normal tissue. The difference between the mean ratios appeared to increase with increasing echo time. All in vivo **tumor** Cho/Cr ratios were greater than the calculated mean in **vitro tumor** ratio, whereas six of the seven volunteers had no detectable Cho and Cr resonances. Two-dimensional correlated MR spectroscopic data revealed that a variety of amino acids have a significantly greater likelihood of being **detected** in **tumor** than in normal tissues. CONCLUSIONS: One-dimensional and 2-D proton MR spectroscopy can help differentiate primary squamous cell **carcinoma** and nodal metastases containing squamous cell **carcinoma** from normal tissue both in **vitro** and in vivo. In addition, 2-D spectroscopy can help identify the presence of certain amino acids in squamous cell **carcinoma** that are not **detected** in normal tissue.

L25 ANSWER 123 OF 373 CA COPYRIGHT 2003 ACS
AN 127:259619 CA
TI Proton and phosphorus nuclear **magnetic resonance** spectroscopy of human brain **tumor** extracts with automatic data **classification**: a preliminary study
AU Nadal, Lydie; Leray, Genevieve; Desbarats, Christophe; Darcel, Francoise; Bansard, Jean-Yves; Bondon, Arnaud; De Certaines, Jacques D.
CS Laboratoire de Resonance Magnetique en Biologie et Medecine, Faculte de Medicine, Universite de Rennes I, Rennes, 35043, Fr.
SO Cellular and Molecular Biology (Paris) (1997), 43(5), 659-673
AB High-resoln. one-dimensional proton and phosphorus and two dimensional COSY proton **Magnetic Resonance** Spectroscopy were used to investigate the lipid and carbohydrate metab. of human brain **tumors**. Sixteen meningioma (MG) (benign **tumors**) and ten glioblastoma (GB) (malignant **tumors**) samples from brain surgery were treated for dual extn. of lipidic and aq. phases before **NMR** processing. A highly significant variation of the 1H metabolite spectral pattern was obsd. between benign and malignant **tumors**. Double extn. method combined with both 1H and 31P **NMR** in vitro analyses provided a large set of biochem. information which may be **statistically analyzed** to elucidate **tumor**-specific biochem. pathways and to improve interpretation of in vivo spectra.

L25 ANSWER 136 OF 373 CA COPYRIGHT 2003 ACS
AN 128:87132 CA
TI Cancer pathology in the year 2000
AU **Mountford, Carolyn E.**; Doran, Sinead; Lean, Cynthia L.; **Russell, Peter**
CS Institute for Magnetic Resonance Research, University of Sydney, Sydney NSW 2006, Australia
SO Biophysical Chemistry (1997), 68(1-3), 127-135
AB A review, with 29 refs. The last one hundred and fifty years has produced the mature and sophisticated discipline of histopathol., yet still leaves

the diagnosis of human cancer, by the best available technique, as more art than science. Proton magnetic resonance spectroscopy (1H MRS) ex vivo identifies the chem. markers of established pathobiol. disorders within excised biopsies and fine needle aspirates, in particular, those assocd. with the development and progression of malignant disease. Alterations to cellular chem. monitored by 1H MRS allow distinction between invasive and pre-invasive lesions of the uterine cervix, and sep. truly benign follicular neoplasms from follicular carcinomas on anal. of fine needle aspirates contg. as few as 106 cells. 1H chem. shift imaging (CSI) dets. the spatial location of these chem. changes and provides insight into the chem. of neoplastic transformation. It is our hypothesis that, by the year 2000, CSI will aid image guided biopsy techniques and that correlation of biopsy histol. with in vivo localized 1H MRS data will: (a) lead to improved assessment of the extent of malignant disease and (b) establish the sensitivity and specificity of in vivo 1H MRS for the simultaneous detn. of the size, location and neoplastic potential of a tumor mass.

L25 ANSWER 148 OF 373 CA COPYRIGHT 2003 ACS
AN 125:162492 CA
TI Diagnostic potential for **cancer** via 1H **magnetic resonance** spectroscopy of colon tissue
AU Bezabeh, Tedros; **Smith, Ian C. P.**; Krupnik, Eduardo; **Somorjai, Ray L.**; Kitchen, David G.; Bernstein, Charles N.; Pettigrew, Norman M.; Bird, Ranjana P.; Lewin, Klaus J.; Briere, Kathleen M.
CS Institute Biodiagnostics, National Research Council, Winnipeg, MB, R3B 1Y6, Can.
SO Anticancer Research (1996), 16(3B, Proceedings of the Special Symposium on "Lipid Metabolism and Function in Cancer", 1995), 1553-1558
AB Specimens of colon tissue were examd. by 1H MRS (360 MHz) to det. the usefulness of rat colon as a model for human colon, particularly for the characterization of preneoplastic lesions. Human tissue was characterized by 1H MRS as a precursor to in vivo studies. For both tissues, resonances from mobile lipids were not characteristic of pure mucosa but correlated with the presence of submucosa. The mean intensities of the resonances at 3.2 and 3.4 ppm (assigned mainly to choline-contg. compds. and taurine, resp.) of rat mucosa compared to those of human mucosa, and of rat tumors compared to human tumors, were not significantly different, while both resonances were significantly more intense in rat tumors compared to rat mucosa. The spectra of premalignant lesions in rat colon have features between those due to tumors and normal tissue. We conclude that rat colon is a useful model for human colon in 1H MR spectroscopic studies. MR spectra from human colon control tissue and tumors were classified with 100% accuracy using multivariate anal.

L25 ANSWER 149 OF 373 CA COPYRIGHT 2003 ACS
AN 125:136607 CA
TI Human **cancers** detected by proton **MRS** and chemical shift imaging ex vivo
AU **Mountford, Carolyn E.**; Mackinnon, Wanda B.; **Russell, Peter**; Rutter, Allison; Delikatny, Edward J.
CS Institute Magnetic Resonance Research, University Sydney, 2006, Australia
SO Anticancer Research (1996), 16(3B, Proceedings of the Special Symposium on "Lipid Metabolism and Function in Cancer", 1995), 1521-1531
AB Proton magnetic resonance spectroscopy (1H MRS) has the potential to become a diagnostic adjunct for the detection and grading of human neoplastic disease. This paper describes the use of proton MRS to document changes arising in the lipid chem. of biopsies arising from the human uterine cervix, thyroid and colon and demonstrates the diagnostic power of ex vivo spectroscopy. Proton chem. shift imaging (CSI) is further used to det. the

spatial location of lipid changes in ex vivo human biopsy specimens and provides insight into the chem. of neoplastic transformation.

L25 ANSWER 151 OF 373 CA COPYRIGHT 2003 ACS
AN 125:136722 CA
TI Proton nuclear **magnetic resonance** spectroscopy of plasma lipoprotein: Technical problems and potential interest in **cancer** disease
AU de Certaines, J. D.; Nadal, L.; Leray, G.; Serrai, H.; Lewa, C. J.
CS Laboratoire de Resonance Magnetique en Biologie et Medecine, Faculte de Medecine, Rennes, 35043, Fr.
SO Anticancer Research (1996), 16(3B, Proceedings of the Special Symposium on "Lipid Metabolism and Function in Cancer", 1995), 1451-1460
AB A review with 46 refs. This paper discusses several methods presently available for analyzing lipoprotein **NMR** spectra. Two main steps can be distinguished: **NMR** signal processing and data anal. Time domain (wavelet transform) and frequency domain (curve fitting) signal processing methods are compared. **Statistical** methods of data anal. (Ascending Hierarchical Classification, Correspondence Anal. and Principal Component Anal.) were tested on simulated **NMR** data of plasma lipoprotein with different nos. of sampling points and different noise levels. New interest in plasma lipoprotein **anal.** in **cancer** biol. is finally discussed in the light of previous clin. and exptl. results and of understanding of lipid metab. in **cancer**.

L25 ANSWER 172 OF 373 MEDLINE
AN 97021079 MEDLINE
TI Proton **magnetic resonance** and human thyroid neoplasia III. **Ex vivo** chemical-shift microimaging.
AU Rutter A; Kunnecke B; Dowd S; Russell P; Delbridge L; Mountford C E
CS Department of Cancer Medicine, University of Sydney, New South Wales, Australia.
SO JOURNAL OF MAGNETIC RESONANCE. SERIES B, (1996 Mar) 110 (3) 240-8.
AB **Magnetic-resonance** chemical-shift microimaging, with a spatial resolution of 40 x 40 microns, is a modality which can detect alterations to cellular chemistry and hence markers of pathological processes in human tissue **ex vivo**. This technique was used as a chemical microscope to assess follicular thyroid neoplasms, lesions which are unsatisfactorily investigated using standard histopathological techniques or water-based **magnetic-resonance** imaging. The chemical-shift images at the methyl frequency (0.9 ppm) **identify** chemical heterogeneity in follicular **tumors** which are histologically homogeneous. The observed changes to cellular chemistry, detectable in foci of approximately 100 cells or less, support the existence of a preinvasive state hitherto unidentified by current pathological techniques.

L25 ANSWER 182 OF 373 CA COPYRIGHT 2003 ACS
AN 122:209010 CA
TI Classification of brain **tumors** by ex vivo 1H **NMR** spectroscopy
AU Rutter, Allison; Hugenholz, Herman; Saunders, John K.; **Smith, Ian C. P.**
CS Inst. Biodiagnostics, Natl. Res. Council, Winnipeg, ON, Can.
SO Journal of Neurochemistry (1995), 64(4), 1655-61
AB Ex vivo biopsy samples from human brain tumors and normal brain have been examd. by high-resoln. proton magnetic resonance spectroscopy. Parameters from one-dimensional 1H spectra, two-dimensional COSY spectra, and transverse relaxation time (T2) data were used to classify the tumors according to the histopathol. diagnoses. The ratio of the area between 3.4 and 3.1 ppm to that between 1.5 and 1.1 ppm distinguished glioblastomas from astrocytomas and normal brain, and appeared to be indicative of

malignant potential. In support of the one-dimensional data, crosspeaks in the COSY spectra of brain specimens classified glioblastomas and metastases into one group and the more benign tumors, meningiomas, astrocytomas, and normal brain into a second group. The transverse relaxation of the resonance at 1.3 ppm was fitted by a model with two T2 values. The longer T2 value could be used to distinguish glioblastomas from normal brain, the latter having a much longer long T2 value. Astrocytomas showed a continuum of T2 values between glioblastomas and normal brain, with the grade of the astrocytoma correlating roughly with the value of the long T2 component.

L25 ANSWER 184 OF 373 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1995:255211 BIOSIS
TI Diagnosis of follicular thyroid lesions by proton magnetic resonance on fine needle **biopsy**.
AU Lean, Cynthia L.; Delbridge, Leigh; **Russell, Peter**; May, George L.; MacKinnon, Wanda B.; Roman, Sandrine; Faheyi, Thomas J. Ii; Dowd, Susan; **Mountford, Carolyn E. (1)**
CS (1) Dep. Medicine, Univ. Sydney, Sydney, NSW 2006 Australia
SO Journal of Clinical Endocrinology & Metabolism, (1995) Vol. 80, No. 4, pp. 1306-1311.
AB Most thyroidectomies are currently performed for diagnostic purposes. It has been established that proton magnetic resonance spectroscopy (MRS) on excised thyroid tissue can distinguish normal thyroid from invasive carcinomas (P lt 0.0001). The purpose of this study was to assess whether the same discrimination could be obtained preoperatively from fine needle **biopsy** (FNB). This has clinical importance because cytological examination of fine needle aspirates cannot distinguish between benign and malignant follicular thyroid lesions. Here we demonstrate a sensitivity of 95% for proton MRS to correctly identify clinically or histologically proven **carcinoma**. **MRS** measurements were made on FNB specimens (containing as few as 10' cells) from solitary thyroid nodules. MR assessment of FNB was inconsistent with that of the corresponding tissue in only 6.5% of cases. The discrimination between cancer and normal tissue was based on altered cellular chemistry measured as a one-dimensional spectral ratio of resonances from the amino acid lysine and lipid. Benign follicular lesions were separated into two groups: 67% with a spectral ratio similar to malignant thyroid tumors, and 33% with a spectral ratio comparable to that in normal thyroid tissue. Thus, in contrast with histopathology, MRS offers a method for assessment of FNB of follicular lesions with the potential to identify a biologically benign group, which could avoid thyroid surgery for purely diagnostic purposes.

L25 ANSWER 197 OF 373 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1995:159483 BIOSIS
TI **Computerized** consensus diagnosis: A classification strategy for the robust analysis of MR spectra. I. Application to 1H spectra of thyroid neoplasms.
AU Somorjai, Ray L. (1); Nikulin, Alexander E.; Pizzi, Nic; Jackson, Dick; Scarth, Gordon; Dolenko, Brion; Gordon, Heather; Russell, Peter; Lean, Cynthia L.; Delbridge, Leigh; Mountford, Carolyn E.; Smith, Ian C. P.
CS (1) 435 Ellice Avenue, Winnipeg, MB R3B 1Y6 Canada
SO Magnetic Resonance in Medicine, (1995) Vol. 33, No. 2, pp. 257-263.
AB We introduce and apply a new classification strategy we call **computerized** consensus diagnosis (CCD). Its purpose is to provide robust, reliable classification of biomedical data. The strategy involves the cross-validated training of several classifiers of diverse conceptual and methodological origin on the same data, and appropriately combining their outcomes. The strategy is tested on proton **magnetic resonance** spectra of human thyroid **biopsies**, which are successfully allocated to normal or

carcinoma classes. We used Linear Discriminant **Analysis**, a Neural Net-based method, and Genetic Programming as independent classifiers on two spectral regions, and chose the median of the six classification outcomes as the consensus. This procedure yielded 100% specificity and 100% sensitivity on the training sets, and 100% specificity and 98% sensitivity on samples of known malignancy in the test sets. We discuss the necessary steps any classification approach must take to guarantee reliability, and stress the importance of fuzziness and undecidability in robust classification.

L25 ANSWER 198 OF 373 CA COPYRIGHT 2003 ACS
AN 125:29414 CA
TI Characteristic metabolic profiles revealed by 1H **NMR** spectroscopy for three types of human brain and nervous system **tumors**
AU Florian, Catarina L.; Preece, Nicholas E.; Bhakoo, Kishore K.; Williams, Stephen R.; Noble, Mark
CS Royal College of Surgeons Unit of Biophysics, Institute of Child Health, London, WC1N 1EH, UK
SO NMR in Biomedicine (1995), 8(6), 253-264
AB Cell culture techniques, high-resoln. in vitro 1H **NMR** spectroscopy, and chromatog. analyses were used to compare the properties of three types of human brain and nervous system **tumors**. Cell lines were immunocytochem. characterized at all stages in culture with specific antibodies. Intracellular metabolites present in cell exts. were analyzed by 1H **NMR** spectroscopy and by HPLC. The spectra from meningiomas, neuroblastomas, and glioblastomas displayed, in addn. to similarities -- including the presence of signals from leucine, isoleucine, valine, threonine, lactate, acetate, glutamate, choline-contg. compds. and glycine -- certain distinguishing metabolic features. Spectra from meningiomas featured relatively high signals from alanine. Intense signals from creatine were present in neuroblastoma spectra, while in spectra from glioblastoma they were not detectable. We found **statistically** significant differences by 1H **NMR** spectroscopy in the amts. of alanine, glutamate, creatine, phosphorylcholine and threonine among the types of **tumors examd**. HPLC detns. confirmed that there were also other metabolites specific to a type of **tumor**, such as taurine, γ-aminobutyric acid, and serine. We suggest that these findings have potential relevance for the development of non-invasive diagnosis of **tumor** lineage by 1H **NMR** spectroscopy in vivo.

L25 ANSWER 220 OF 373 CA COPYRIGHT 2003 ACS
AN 122:4566 CA
TI Metabolism of breast **cancer** cells as revealed by non-invasive **magnetic resonance** spectroscopy studies
AU Kaplan, Ofer; Cohen, Jack S.
CS Department of Surgery, Tel-Aviv Medical Center, Tel-Aviv, Israel
SO Breast Cancer Research and Treatment (1994), 31(2/3), 285-99
AB A review with 78 refs. The basis for the use of NMR spectroscopy as a tool to study the metab. of breast cancer cells is described. The differences between proton (1H), carbon (13C), and phosphorus (31P) NMR methods is explained, and the techniques of cell exts., cell suspensions and perfusion methods for cells are detailed. To perfuse cells they are preferably trapped in a gel matrix, either in the form of a thread or a bead. The gel must have appropriate properties that enables efficient oxygenation and availability of nutrients and drugs. The metabolic effects of perfusion of breast cancer cells with nutrients, drugs, and hormones are reported, and the clin. relevance of these results and methods are outlined.

L25 ANSWER 222 OF 373 CA COPYRIGHT 2003 ACS
AN 121:225544 CA

TI 1H NMR spectroscopic characterization of perchloric acid extracts from breast carcinomas and non-involved breast tissue
AU Gribbestad, Ingrid S.; Petersen, Steffen B.; Fjoesne, Hans E.; Kvinnsland, Stener; Krane, Jostein
CS MR Center, SINTEF UNIMED, Trondheim, N 7034, Norway
SO NMR in Biomedicine (1994), 7(4), 181-94
AB Two-dimensional shift-correlated and homonuclear J-resolved spectroscopy were used to identify coupled resonances in the spectra. Chem. shifts, multiplicities and spin-spin coupling consts. of several non-resolved resonances in the one-dimensional spectra could be detd. by the two-dimensional methods. Several differences in the metabolite content of the two types of exts. were established. The spectra of exts. from non-involved tissue were dominated by signals from glucose and other carbohydrates, while most of the tumors had very low or no detectable levels of glucose. High concns. of lactate, taurine and succinate, an increase of the phosphocholine level, and a very low phosphocreatine level were characteristic findings in the 1H spectra of tumor exts. The variation in the level of myo-inositol follows the variation in glucose for the two types of tissue. Scyllo-inositol was for the first time obsd. in the **NMR** spectra from **breast** tissue. Uridine 5'-diphospho-N-acetylglucosamine and uridine 5' -diphospho-N- acetylgalactosamine have been identified and there is an increased level of these two hexoses in the tumor tissue. These results provide insight into breast tumor metab., by simultaneously detecting a large no. of metabolites and demonstrate the potential for using 1H NMR spectroscopy for studying different metabolic pathways in breast tumors. At the same time they provide useful information for interpretation of in vivo 1H **NMR** spectra of **breast tumors**.

L25 ANSWER 224 OF 373 CA COPYRIGHT 2003 ACS
AN 121:77455 CA
TI Proton magnetic resonance and human cervical neoplasia. II. Ex vivo chemical-shift microimaging
AU Kuennecke, Basil; Delikatny, E. James; **Russell, Peter**; Hunter, J. Christopher; **Mountford, Carolyn**
CS Membrane MR Unit, Univ. Sydney, 2006, Australia
SO Journal of Magnetic Resonance, Series B (1994), 104(2), 135-42
AB Proton chem.-shift imaging at 8.5 T has been used to detect malignant foci in small (6 mm3) biopsies from the human uterine cervix. Images based on the lipid resonances of frankly malignant cells discriminate between tumor tissue and host stroma and distinguish invasive from preinvasive cervical cancer (n = 7). With this method, foci of malignant cells were revealed in 500 μm slices with an in-plane resoln. of 40 by 160 μm. The MR intensity maps reflected the local distribution of malignant cells as assessed by histopathol. The lower signal-to-noise ratio inherent for these non-water-based images was improved by applying postacquisitional matched Gaussain window functions, thus effecting a substantial increase in contrast with minimal loss in spatial resoln.

L25 ANSWER 235 OF 373 CA COPYRIGHT 2003 ACS
AN 120:101020 CA
TI Detecting fatty acids of dietary origin in normal and cancerous human breast tissue by carbon-13 nuclear magnetic resonance spectroscopy
AU Victor, T.A.; Bergman, A.; Knop, R.H.
CS Med. Sch., Northwestern Univ., Evanston, IL, 60201, USA
SO British Journal of Cancer (1993), 68(2), 336-341
AB Natural abundance 13C NMR was used to det. relative amts. of fatty acid subclasses present in fibroadipose tissue from the human breast in healthy and cancer patients and in breast carcinoma tissue. Resonances

corresponding to the carbon atoms of triacylglycerides were obtained when adipose tissue constituted >10% of the carcinoma. Resonances corresponding to phospholipids and proteins were also obsd. when the percentage of adipose tissue was lower. No significant difference between the levels of unsatd. fatty acids in adipose tissue from cancer and noncancer patients was found. However, significant differences in the levels of monounsatd. and satd. fatty acids of carcinoma compared to noncancerous tissue was found, as was a nearly significant difference for the levels of polyunsatd. fatty acids in these 2 tissue types. These findings suggest an alteration of cellular lipid compn. in neoplastic mammary tissue.

L25 ANSWER 248 OF 373 CA COPYRIGHT 2003 ACS
AN 118:76405 CA
TI Cell and membrane lipid analysis by proton **magnetic resonance** spectroscopy in five **breast cancer** cell lines
AU Le Moyec, L.; Tatoud, R.; Eugene, M.; Gauville, C.; Primot, I.; Charlemagne, D.; Calvo, F.
CS Lab. RMN, Hop. St. Louis, Paris, 75010, Fr.
SO British Journal of Cancer (1992), 66(4), 623-8
AB The lipid compn. of 5 human breast cancer cell lines (MCF-7, T47D, ZR-75-1, SKBR3, and MDA-MB231) was assessed by proton magnetic resonance spectroscopy (MRS) in whole cells and membrane-enriched fractions. The proportions of the 3 main lipid resonances in 1D spectra were different for each cell line. These resonances included mobile Me and methylene functions from fatty acids of triglycerides and phospholipids and N-tri-Me from choline of phospholipids. T47D and ZR-75-1 cells presented a high methylene/Me ratio (6.02 ± 0.35 and 6.28 ± 0.90). This ratio was significantly lower for SKBR3, MCF-7, and MDA-MB231 cells (2.76 ± 0.22, 2.27 ± 0.57, and 1.39 ± 0.39). The N-tri-Me/Me ratio was high for MDA-MB231 and SKBR3 cells (1.38 ± 0.54 and 0.86 ± 0.32), but lower for MCF-7, T47D, and ZR-75-1 cells (0.49 ± 0.11, 0.16 ± 0.07, and 0.07 ± 0.03). 2D COSY spectra confirmed these different proportions in mobile lipids. From 1D spectra obtained on membrane prepns., T47D and ZR-75-1 were the only cell lines to retain a signal from mobile methylene functions. These differences might be related to the heterogeneity found for several parameters of these cells (tumorigenicity, growth rate, hormone receptors); an extended no. of cases from fresh samples might enable clin. correlations.

L25 ANSWER 252 OF 373 CA COPYRIGHT 2003 ACS
AN 117:65676 CA
TI Multivariate image regression and analysis. Useful techniques for the evaluation of clinical **magnetic resonance** images
AU Grahn, Hans F.; Saeaef, Jan
CS Astra Arcus AB, Soederaelje, S-151 85, Swed.
SO Chemometrics and Intelligent Laboratory Systems (1992), 14(1-3), 391-6
AB Multivariate image anal. (MIA) and multivariate image regression (MIR) techniques are useful tools in the extn. of information from **magnetic resonance** images. They aid in the characterization of different tissues and can be used to describe their size and distribution. The information obtained can be used to **monitor growth**, progression, and effects of a treatment. The methodol. is illustrated by a clin. example. The ongoing development of MIA and MIR, combining parameters from different imaging modalities, is commented on.

L25 ANSWER 261 OF 373 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1992:349468 BIOSIS
TI DIFFERENTIATION OF HUMAN PROSTATE **CANCER** FROM BENIGN HYPERTROPHY BY IN-

VITRO PROTON **NMR**.
AU FOWLER A H; PAPPAS A A; HOLDER J C; FINKBEINER A E; DALRYMPLE G V; MULLINS M S; SPRIGG J R; KOMOROSKI R A
CS DEP. RADIOL., UNIV. ARKANSAS MED. SCI., LITTLE ROCK, ARKANSAS 77205, USA.
SO MAGN RESON MED, (1992) 25 (1), 140-147.
AB In **vitro** 1H **NMR** spectra were acquired for perchloric acid extracts of tissue samples of human prostate. Seven patients were diagnosed with prostate **cancer**, 13 with benign prostatic hypertrophy, and 3 with both conditions. **Statistically** significant differences between the **cancer** and benign groups were seen for the metabolite peak area ratios of citrate, creatine, and phosphorylcholine to alanine, and citrate to glutamate. There was no corrlation of Gleason grade with any of the ratios **measured** for the **cancer** samples. Spectra from different sections of large **tumors** often yielded substantially different area ratios, confirming the heterogeneous nature of these prostate **tumors**.

L25 ANSWER 263 OF 373 CA COPYRIGHT 2003 ACS
AN 118:35301 CA
TI Identification of lactate, threonine and alanine in rat thymus and tumorigenic lymphoid cells using proton 2-D COSY NMR spectroscopy
AU Tang, Hailun L.; Buist, Richard J.; Rixon, Raymond H.; Whitfield, James F.; **Smith, Ian C. P.**
CS Inst. Biol. Sci., Natl. Res. Council Canada, Ottawa, ON, K1A 0R6, Can.
SO NMR in Biomedicine (1992), 5(2), 69-74
AB One- and 2-dimensional 1H NMR spectra were obtained for normal murine thymus and malignant lymphoma tissue, as well as for the supernatant fractions from high-speed centrifugal sepns. Crosspeaks in the 2-dimensional spectra resembled those reported by others for adenocarcinoma and leukemic lymphoblast cells, assigned tentatively to the carbohydrate fucose. However, for the present systems, spectral anal. and the spectral response to addn. of known compds. led to assignment of the crosspeaks as follows: 1.33-4.12 ppm, lactate anion; 1.33-4.26 ppm, threonine; 1.48-3.78 ppm, alanine. Differences between the NMR data for the normal and malignant specimens were only in the relative intensities of the peaks. No peaks characteristic of fucose were found in spectra of cytosol, tissue, or membrane lipids. Thus, the NMR data for malignant lymphoma cells are significantly different from those for adenocarcinoma and leukemic lymphoblasts. The **NMR** characteristics of different types of **cancer** cell must be individually detd.

L25 ANSWER 272 OF 373 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1991:343155 BIOSIS
TI IN-**VITRO** PROTON SPECTROSCOPY OF NORMAL AND ABNORMAL PROSTATE.
AU YACOE M E; SOMMER G; PEEHL D
CS DEP. DIAGNOSTIC RADIOL., STANFORD UNIV. MED. CENT., STANFORD, CALIF. 94305.
SO MAGN RESON MED, (1991) 19 (2), 429-438.
AB Previous biochemical and 13C **NMR** spectroscopic data have suggested that the metabolism of citrate, a secretory product of normal prostate, may be interrupted in prostate **cancer**. In the present study in **vitro** 1H **NMR** spectroscopy was used to see if cell strains derived from prostate **cancers** could be reliably distiguished from those of normal prostate epithelium. High-resolution one-dimensional and two-dimensional J-resolved 1H **NMR** spectra as well as gas chromatography coupled with mass spectroscopy were used to study extracts of highly defined cell strains from normal peripheral zone, normal central zone, adenocarcinoma, and benign prostatic hyperplasia. Resonances assigned to citric acid and related metabolites were **identified**. Cell strains derived from prostate **cancers** tended to have smaller amounts of citrate than those from normal prostate epithelium.

However, the differences were small and not **statistically** significant. The lack of **statistically** significant differences may reflect the variability present in both normal and abnormal cell strains and thus underscore the well-known difficulty in differentiating normal and cancerous tissues.

L25 ANSWER 279 OF 373 CA COPYRIGHT 2003 ACS
AN 116:37136 CA
TI Biological and **NMR** markers for **cancer**
AU Czuba, Margaret; **Smith, Ian C. P.**
CS Inst. Biol. Sci., Natl. Res. Counc., Ottawa, ON, K1A 0R6, Can.
SO Pharmacology & Therapeutics (1991), 50(2), 147-90
AB A review with many refs. The search for a universal tumor marker continues. Present markers range from tumor products (polyamines, glycoproteins, peptides, hormones, or carbohydrate-linked markers) to reaction products produced by the host tissues during tumor invasion. Techniques used to identify them include the classical methods of histol. and cytochem. as well as the more recent RIA and metabolic probes. The in vivo techniques of increasing use for patient monitoring are MRS (magnetic resonance spectroscopy) and MRI (magnetic resonance imaging). The efficiency of some markers and statistical methods used in analyzing data are discussed, as are the ethical problems surrounding the use of new testing methods. Recent developments in MRI and MRS, marker elucidation, and evidence for a new autocrine differentiation-inhibiting factor (ADIF) are reviewed. Future needs and approaches focus on greater utilization of indicators of the preneoplastic state and of risk to cancer, as well as more careful attention to statistical anal.

L25 ANSWER 292 OF 373 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1990:178039 BIOSIS
TI UTERINE CERVICAL PUNCH **BIOPSY** SPECIMENS CAN BE ANALYZED BY PROTON MRS.
AU **MOUNTFORD C E**; DELIKATNY E J; DYNE M; HOLMES K T; MACKINNON W B; FORD R; HUNTER J C; TRUSKETT I D; **RUSSELL P**
CS DEP. CANCER MED., BLACKBURN BUILDING, UNIV. SYDNEY, N.S.W. 2006, AUST.
SO MAGN RESON MED, (1990) 13 (2), 324-331.
AB **Biopsy** specimens of the uterine cervix, including colposcopically directed punch **biopsy** specimens of females with atypical Papanicolaou smear tests, are suitable for analysis by magnetic resonance (MR) spectroscopy. A narrow lined lipid MR spectrum, characteristic of malignant tissue, is obtained from a 6-mm3 **biopsy** specimen of histologically confirmed squamous carcinoma of the cervix. In contrast, specimens containing inflammatory cells generate a broad component only centered at 1.3 ppm with a T2 relaxation value of less than 350 ms. Most **biopsy** specimens which contain dysplastic cells or evidence of human papilloma virus (HPV) infection have a discernible lipid spectrum similar to that of the malignant tissue specimen. Long T2 relaxation values found in malignant tissue specimens at 1.3 and 1.2 ppm are observed in some but not all the **biopsies** which show evidence of HPV infection. The suitability of small tissue samples such as punch **biopsy** specimens, for study by MR illustrates the sensitivity of this technique and its potential as an aid to histopathological discrimination between the various precursor states of cervical cancer.

L25 ANSWER 323 OF 373 CA COPYRIGHT 2003 ACS
AN 109:186632 CA
TI Application of nuclear **magnetic resonance** spectroscopy to the study of breast **cancer**
AU Degani, H.; Victor, T. A.; Neeman, M.; Itzchak, Y.; Horowitz, A.; Kaye, A. M.
CS Isot. Dep., Weizmann Inst. Sci., Rehovot, 76100, Israel

SO Progress in Cancer Research and Therapy (1988), 35(Horm. Cancer 3), 378-83
AB 31P **NMR** studies of the phosphate metabolites in perifused human breast **tumors** are presented which were aimed at **evaluating** the potential of the **NMR** technique to discriminate between **benign** and **malignant** conditions and to predict responsiveness to endocrine therapy. The energetics and glucose metab. in perfused T47D human breast **cancer** cells, utilizing 31P and 13C **NMR** methods, are described.

L25 ANSWER 337 OF 373 CA COPYRIGHT 2003 ACS
AN 108:164155 CA
TI Multinuclear **magnetic resonance** spectral studies of normal and **tumor** rat mammary tissues
AU Block, Ronald E.; Parekh, Barbara C.
CS Dep. Radiol., Mt. Sinai Med. Cent., Miami Beach, FL, 33140, USA
SO Journal of Magnetic Resonance (1969-1992) (1987), 75(3), 517-22
AB Differences in metab. of normal and **tumor** tissue of rats were studied by **NMR** spectroscopy and changes in **tumor growth** rate after hormone treatments were also **examd**. Both proton and 13C NMR spectral differences were obsd. for excised normal (s.c. fat, lactating mammary) and tumor (mammary adenocarcinoma) tissues. In vivo changes in tumor growth rate after treatment with Delestrogen were obsd. with both proton and 31P NMR. The results are discussed with respect to **tumor**, esp. **mammary tumor**, imaging by **NMR**.

L25 ANSWER 350 OF 373 CA COPYRIGHT 2003 ACS
AN 105:111355 CA
TI High resolution proton NMR detects metastatic potential
AU **Mountford, C. E.**; Holmes, K. T.; Wright, L. C.; May, G. L.; Williams, P. G.; **Smith, I. C. P.**
CS Ludwig Inst. Cancer Res., Univ. Sydney, Sydney, 2006, Australia
SO Magn. Reson. Cancer, Proc. Int. Conf. (1986), Meeting Date 1985, 111-18. Editor(s): Allen, Peter Sutcliffe; Boisvert, Donald P. J.; Lentle, Brian C. Publisher: Pergamon, Toronto, Ont.
AB Cancerous tissue or a suspension of cultured **cancer** cells gives a high-resoln. 1H **NMR** spectrum similar to that obtained from lipids. The NMR resonances, which arise from mols. in or attached to the plasma membrane, are consistent with unusually high levels of neutral lipid in the plasma membranes of cancer cells. Two-dimensional NMR studies identify triglyceride to be one of the main constituents of these lipid domains. Resoln. enhancement techniques applied to either 1- or 2-dimensional NMR data allow identification of at least 4 resonances under the broad methylene peak at 1.2 ppm. The biol. status of cancer cells, such as metastatic potential and drug sensitivity profiles, can be identified by the behavior of ≥1 of these methylene resonances. A T2 of >600 ms measured for the resonance at 1.25 ppm coincides with the ability of the cells to metastasize. Those cells which have a T2 of <200 ms for this particular resonance have not been found to generate secondary growths.

L25 ANSWER 352 OF 373 CA COPYRIGHT 2003 ACS
AN 105:111378 CA
TI Complete proton magnetic resonance in whole cells
AU Bloom, Myer; Holmes, Kerry T.; **Mountford, Carolyn E.**; Williams, Philip G.
CS Ludwig Inst. Cancer Res., Univ. Sydney, Sydney, 2006, Australia
SO Journal of Magnetic Resonance (1969-1992) (1986), 69(1), 73-91
AB The 1H-NMR spectrum of whole cells is a complex, composite spectrum with a myriad of dipolar broadened (broadline) and nondipolar-broadened (high-resoln.) contributions. Methods of sepg. and characterizing the different types of components are described and developed using a phospholipid

bilayer model membrane and the R13762 rat mammary adenocarcinoma cell line. It was found that 35% of the protons in the 1H-NMR spectrum of the R13762 cells are assocd. with the high-resoln. spectrum. Of the remaining 65%, ~40% can be assigned to the characteristic fluid membrane dipolar-broadened, super-Lorentzian lines. A further 20% can be assigned to dipolar-broadened lines of width several hundred Hertz, from rigid parts of cytoplasmic proteins. Quant. anal. of the narrow methylene peak, which has been used to characterize the metastatic properties of R13762 cells, shows that it contains 7.3% of all the protons in the cell. The introduction of spectroscopic selection methods such as the CPMG pulse sequence and the Jeener-Broekaert echo sequence has made it possible to analyze simultaneously the broadline and high-resoln. characterizes of an intact viable cell.

L25 ANSWER 356 OF 373 CA COPYRIGHT 2003 ACS
AN 103:50718 CA
TI Differences in **NMR** spectra between **tumor** clones of defined metastatic potential
AU Bines, Steven D.; Tomasovic, Stephen P.; Frazer, James W.; Boddie, Arthur W., Jr.
CS Syst. Cancer Cent., Univ. Texas, Houston, TX, 77030, USA
SO Journal of Surgical Research (1985), 38(5), 546-52
AB **NMR** can discriminate between **malignant** and normal tissues. This study attempts to **det.** if **NMR** can discriminate between **tumor** clones of differing metastatic potential derived from the same parent tumor. Rat 13762NF mammary adenocarcinoma clones of either high (MTLn3), intermediate (MTC), or low (MTPa) metastatic potential were grown in roller-bottle tissue culture, harvested during exponential growth phase, centrifuged to form a 0.75-cm+ pellet, and analyzed in a Varian 360L spectrometer operating at 60.0 MHz. Di-Me sulfoxide (10%) was used as an internal std. at 3.1 ppm downfield from tetra-Me silane. NMR spectra of replicate samples were analyzed and compared. The position of the water peak for MTLn3 was 5.14 vs. 5.07 for MTC and 5.05 for MTPa. Integrated area of upfield peaks (where glycoproteins residues are expected to resonate) was 47.43 for MTLn3 and 40.95 for MTC vs. 32.06 for MTPa. Previous work with these tumor clones suggests quant. changes in surface glycoproteins are assocd. with differences in metastatic behavior. This study demonstrates differences in water peaks between cells of high, intermediate, and low metastatic potential and differences in the integrated area of upfield spectral peaks. How these observations relate to the biol. properties of the cells is uncertain. If they prove to have general validity, NMR could be used to profile biol. potential of human malignancies.

L25 ANSWER 357 OF 373 CA COPYRIGHT 2003 ACS
AN 105:149167 CA
TI **Cancer** metastasis detected by **NMR**
AU **Mountford, Carolyn E.**
CS Ludwig Inst. Cancer Res., Univ. Sydney, Sydney, Australia
SO Chemistry in Australia (1985), 52(9), 347-51
AB NMR studies, including T2 relaxation, of lipids are described in relation to predicting the metastatic potential of tumors; the method shows promise in accurately predicting metastatic potential with biopsy samples. Explanations of NMR spectra of lipids, the role of plasma membrane lipids in the spectra, and neutral lipids responsible for the NMR signal are discussed.

L25 ANSWER 360 OF 373 CA COPYRIGHT 2003 ACS
AN 102:22229 CA

TI High-resolution proton nuclear **magnetic resonance** analysis of metastatic **cancer** cells
AU **Mountford, Carolyn E.**; Wright, Lesley C.; Holmes, Kerry T.; Mackinnon, Wanda B.; Gregory, Patricia; Fox, Richard M.
CS Ludwig Inst. Cancer Res., Univ. Sydney, Sydney, 2006, Australia
SO Science (Washington, DC, United States) (1984), 226(4681), 1415-18
AB High-resoln. proton **NMR** studies of intact **cancer** cells revealed differences between cells with the capacity to metastasize and those that produce locally invasive tumors. The NMR resonances that characterize the metastatic cells were assocd. with an increased ratio of cholesterol to phospholipid and an increased amt. of plasma membrane-bound cholesterol ester. High-resoln. NMR spectroscopy could therefore be used to assess the metastatic potential of primary tumors.

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L3 338055 S NMR OR MR SPECTR? OR MRS OR MAGNETIC RESONANCE SPECTR?
L4 573480 S CANCER OR CARCINOMA OR LUMP OR LESION OR TUMOR OR NEOPLASM
L5 154630 S L3/TI,ST
L6 627 S L5 AND L4/TI
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L9 3 S L8 AND L2
E SOMORJAI R/AU
L10 60 S E3-8
L11 3 S L10 AND (CLASSIF? OR DISCRIM? OR DISTINGU? OR IDENTIF?)/TI
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L16 ANSWER 6 OF 75 MEDLINE
AN 2001505789 MEDLINE
TI Diagnosis and prognosis of breast **cancer** by **magnetic resonance spectroscopy** of fine-needle aspirates analysed using a statistical **classification** strategy.
AU Mountford C E; **Somorjai R L**; Malycha P; Gluch L; Lean C; Russell P; Barraclough B; Gillett D; Himmelreich U; Dolenko B; Nikulin A E; Smith I C
CS Department of Magnetic Resonance in Medicine, Institute for Magnetic Resonance Research, University of Sydney, Sydney, New South Wales, Australia.. caro@imrr.usyd.edu.au
SO BRITISH JOURNAL OF SURGERY, (2001 Sep) 88 (9) 1234-40.
AB BACKGROUND: The aim was to develop robust classifiers to analyse magnetic

resonance spectroscopy (MRS) data of fine-needle aspirates taken from breast tumours. The resulting data could provide computerized, classification-based diagnosis and prognostic indicators. METHODS: Fine-needle aspirate biopsies obtained at the time of surgery for both benign and malignant breast diseases were analysed by one-dimensional proton MRS at 8.5 Tesla. Diagnostic correlation was performed between the spectra and standard pathology reports, including the presence of vascular invasion by the primary cancer and involvement of the excised axillary lymph nodes. RESULTS: Malignant tissue was distinguished from benign lesions with an overall accuracy of 93 per cent. From the same spectra, lymph node involvement was predicted with an overall accuracy of 95 per cent, and tumour vascular invasion with an overall accuracy of 94 per cent. CONCLUSION: The pathology, nodal involvement and tumour vascular invasion were predicted by computerized statistical classification of the proton MRS spectrum from a fine-needle aspirate biopsy taken from the primary breast lesion.

L16 ANSWER 10 OF 75 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 2000:424022 BIOSIS
TI **Discrimination** between neoplastic and nonneoplastic brain **lesions** by use of proton **MR spectroscopy**: The limits of accuracy with a logistic regression model.
AU Butzen, Jennifer; Prost, Robert; Chetty, Veerappu; Donahue, Kathleen; Neppl, Ronald; Bowen, William; Li, Shi-Jiang; Haughton, Victor; Mark, Leighton; Kim, Thomas; Mueller, Wade; Meyer, Glenn; Krouwer, Hendrikus; Rand, Scott (1)
CS (1) Department of Radiology, Froedtert Memorial Lutheran Hospital, Medical College of Wisconsin, 9200 West Wisconsin Avenue, Milwaukee, WI, 53226 USA
SO AJNR, (August, 2000) Vol. 21, No. 7, pp. 1213-1219. print.
AB BACKGROUND AND PURPOSE: The most accurate method of clinical MR spectroscopy (MRS) interpretation remains an open question. We sought to construct a logistic regression (LR) pattern recognition model for the discrimination of neoplastic from nonneoplastic brain lesions with MR imaging-guided single-voxel proton MRS data. We compared the LR sensitivity, specificity, and receiver operator characteristic (ROC) curve area (Az) with the sensitivity and specificity of blinded and unblinded qualitative MRS interpretations and a choline (Cho)/N-acetylaspartate (NAA) amplitude ratio criterion. METHODS: Consecutive patients with suspected brain neoplasms or recurrent neoplasia referred for MRS were enrolled once final diagnoses were established by histopathologic examination or serial neurologic examinations, laboratory data, and imaging studies. Control spectra from healthy adult volunteers were included. An LR model was constructed with 10 input variables, including seven metabolite resonance amplitudes, unsuppressed brain water content, water line width, and the final diagnosis (neoplasm versus nonneoplasm). The LR model output was the probability of tumor, for which a cutoff value was chosen to obtain comparable sensitivity and specificity. The LR sensitivity and specificity were compared with those of qualitative blinded interpretations from two readers (designated A and B), qualitative unblinded interpretations (in aggregate) from a group of five staff neuroradiologists and a spectroscopist, and a quantitative Cho/NAA amplitude ratio > 1 threshold for tumor. Sensitivities and specificities for each method were compared with McNemar's chi square analysis for binary tests and matched data with a significance level of 5%. ROC analyses were performed where possible, and Az values were compared with Metz's method (CORROC2) with a 5% significance level. RESULTS: Of the 99 cases enrolled, 86 had neoplasms and 13 had nonneoplastic diagnoses. The discrimination of neoplastic from control spectra was trivial with the LR, reflecting high homogeneity among the

control spectra. An LR cutoff probability for tumor of 0.8 yielded a specificity of 87%, a comparable sensitivity of 85%, and an area under the ROC curve of 0.96. Sensitivities, specificities, and ROC areas (where available) for the other methods were, on average, 82%, 74%, and 0.82, respectively, for readers A and B, 89% (sensitivity) and 92% (specificity) for the group of unblinded readers, and 79% (sensitivity), 77% (specificity), and 0.84 (Az) for the Cho/NAA > 1 criterion. McNemar's analysis yielded significant differences in sensitivity (napprx86 neoplasms) between the LR and reader A, and between the LR and the Cho/NAA > 1 criterion. The differences in specificity between the LR and all other methods were not significant (napprx13 nonneoplasms). Metz's analysis revealed a significant difference in Az between the LR and the Cho/NAA ratio criterion. CONCLUSION: The upper limits of sensitivity, specificity, and ROC area achieved in the construction of the LR model with MRS data demonstrate the potential for improved discrimination of neoplasm from nonneoplasm relative to either qualitative MRS interpretation by blinded readers or by quantitative interpretation with a Cho/NAA amplitude ratio threshold. The sensitivity, specificity, and ROC curve area of the LR were comparable to unblinded MRS readers who had the benefit of prior imaging studies and clinical data.

L16 ANSWER 22 OF 75 MEDLINE
AN 1998384080 MEDLINE
TI Near-optimal region selection for feature space reduction: novel preprocessing methods for **classifying** MR spectra.
AU Nikulin A E; Dolenko B; Bezabeh T; **Somorjai R L**
CS Institute for Biodiagnostics, National Research Council, Winnipeg, Manitoba, Canada.
SO NMR IN BIOMEDICINE, (1998 Jun-Aug) 11 (4-5) 209-16.
AB We introduce a global feature extraction method specifically designed to preprocess magnetic resonance spectra of biomedical origin. Such preprocessing is essential for the accurate and reliable classification of diseases or disease stages manifest in the spectra. The new method is genetic algorithm-guided. It is compared with our enhanced version of the standard forward selection algorithm. Both seek and select optimal spectral subregions. These subregions necessarily retain spectral information, thus aiding the eventual identification of the biochemistry of disease presence and progression. The power of the methods is demonstrated on two biomedical examples: the discrimination between meningioma and astrocytoma in brain tissue biopsies, and the classification of colorectal biopsies into normal and tumour classes. Both preprocessing methods lead to classification accuracies over 97% for the two examples.

L16 ANSWER 23 OF 75 MEDLINE
AN 1998384074 MEDLINE
TI From **magnetic resonance spectroscopy** to **classification** of **tumors**. A review of pattern recognition methods.
AU Hagberg G
CS Karolinska MR-Research Center, Stockholm University PET-center, Sweden.
SO NMR IN BIOMEDICINE, (1998 Jun-Aug) 11 (4-5) 148-56. Ref: 66
AB This article reviews the wealth of different pattern recognition methods that have been used for magnetic resonance spectroscopy (MRS) based tumor classification. The methods have in common that the entire MR spectra is used to develop linear and non-linear classifiers. The following issues are addressed: (i) pre-processing, such as normalization and digitization, (ii) extraction of relevant spectral features by multivariate methods, such as principal component analysis, linear discriminant analysis (LDA), and optimal discriminant vector, and (iii) classification by LDA, cluster

analysis and artificial neural networks. Different approaches are compared and discussed in view of practical and theoretical considerations.

L16 ANSWER 24 OF 75 CA COPYRIGHT 2003 ACS
AN 129:51572 CA
TI Biochemical **classification** of kidney **carcinoma** biopsy samples using magic-angle-spinning 1H nuclear **magnetic resonance spectroscopy**
AU Moka, Detlef; Vorreuther, Roland; Schicha, Harald; Spraul, Manfred; Humpfer, Eberhard; Lipinski, Marion; Foxall, Peta J. D.; Nicholson, Jeremy K.; Lindon, John C.
CS Department of Nuclear Medicine, University of Cologne, Cologne, D-50924, Germany
SO Journal of Pharmaceutical and Biomedical Analysis (1998), 17(1), 125-132
AB High resoln. 1H NMR spectra using spinning at the magic angle (1H MAS NMR) have been obtained on intact normal and pathol. kidney tissue samples from patients undergoing surgery for renal cell carcinoma (RCC). The spectra were measured on ~80 mg samples and provided high resoln. 1H NMR spectra in which effects of dipolar couplings, chem. shift anisotropy and magnetic susceptibility differences are minimized thus yielding high spectral resoln. Conventional one-dimensional and spin-echo spectra and two-dimensional J-resolved, TOCSY and 1H-13C HMQC spectra were also measured on selected samples and these allowed the assignment of resonances of endogenous substances comprising both cytosolic and membrane components. The tumor tissues were characterized principally by an increased lipid content. These are the first reported results on human tumor tissues using this technique and the approach offers potential for the rapid classification of different types of tumor tissue.

L16 ANSWER 27 OF 75 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1997:441073 BIOSIS
TI Fine-needle **biopsy** specimens of benign breast **lesions distinguished** from invasive **cancer ex vivo** with proton **MR spectroscopy**.
AU **MacKinnon, Wanda B.**; Barry, Peter A.; Malycha, Peter L.; Gillett, David J.; Russell, Peter; Lean, Cynthia L.; Doran, Sinead T.; Barraclough, Bruce H.; Bilous, Michael; Mountford, Carolyn E. (1)
CS (1) Inst. Magenetic Resonance Res., Univ. Sydney, Blackburn Build. DO6, Sydney, NSW 2006 Australia
SO Radiology, (1997) Vol. 204, No. 3, pp. 661-666.
AB PURPOSE: To determine whether invasive breast cancer can be distinguished from benign lesions with proton magnetic resonance (MR) spectroscopy **ex vivo** on the basis of altered cellular chemistry. MATERIALS AND METHODS: Two hundred eighteen fine-needle **biopsy** specimens were obtained in 191 patients undergoing surgery and were analyzed with proton MR spectroscopy. MR spectroscopic and histopathologic findings were compared. RESULTS: Invasive carcinoma produced increased signal at 3.25 ppm, attributable to choline-containing metabolites. Discrimination between invasive carcinoma (n = 82), benign lesions (n = 106), or carcinoma in situ (n = 17) was based on the resonance intensity at 3.25 ppm standardized to the resonance at 3.05 ppm (P lt .001). The ratio of peak height intensities of resonances at 3.25 to those at 3.05 ppm was less than 1.7 in 102 of the 106 normal or benign lesions. All carcinoma in situ specimens with comedonecrosis or a microinvasive component (n = 6) were categorized at MR spectroscopy with invasive carcinoma, while others with in situ disease alone were categorized with benign lesions (n = 11). The sensitivity and specificity of MR spectroscopy in fine-needle **biopsy** specimens in distinguishing benign lesions from invasive cancer were 95% and 96%, respectively. CONCLUSION: Proton MR spectroscopy of fine-needle **biopsy** specimens provides objective diagnostic information that complements findings of conventional

preoperative investigations of breast lesions.

L16 ANSWER 29 OF 75 MEDLINE
AN 97464503 MEDLINE
TI **Classification** of 1H **MR spectra** of biopsies from untreated and recurrent ovarian **cancer** using linear **discriminant** analysis.
AU Wallace J C; Raaphorst G P; **Somorjai R L**; Ng C E; Fung Kee Fung M; Senterman M; Smith I C
CS Institute for Biodiagnostics, National Research Council, Winnipeg, Manitoba, Canada.
SO MAGNETIC RESONANCE IN MEDICINE, (1997 Oct) 38 (4) 569-76.
AB Proton (1H) magnetic resonance (MR) spectra of ex vivo biopsy samples of ovarian cancers provided biochemical information that was used to discriminate cancer from normal ovarian tissue. Possible differences present in intrinsically resistant tumors or changes in biochemistry after the induction of resistance were identified. Using multivariate techniques, in particular linear discriminant analysis (LDA), ovarian cancer was distinguished from normal ovarian tissue with a sensitivity of 100%, a specificity of 95% and an accuracy of 98%. Moreover, LDA was able to distinguish untreated ovarian cancer from recurrent ovarian cancer with a sensitivity of 92%, a specificity of 100%, and an accuracy of 97%; removal of the single "fuzzy" specimen increased the accuracy to 100%. Applications of this knowledge to in vivo measurements could lead to noninvasive diagnosis of ovarian cancer.

L16 ANSWER 35 OF 75 MEDLINE
AN 96344168 MEDLINE
TI **Classification** of 1H **MR spectra** of human brain **neoplasms**: the influence of preprocessing and computerized **consensus** diagnosis on **classification** accuracy.
AU **Somorjai R L**; Dolenko B; Nikulin A K; Pizzi N; Scarth G; Zhilkin P; Halliday W; Fewer D; Hill N; Ross I; West M; Smith I C; Donnelly S M; Kuesel A C; Briere K M
CS Institute for Biodiagnostics, National Research Council, Winnipeg, Manitoba, Canada.
SO JOURNAL OF MAGNETIC RESONANCE IMAGING, (1996 May-Jun) 6 (3) 437-44.
AB We study how classification accuracy can be improved when both different data preprocessing methods and computerized **consensus** diagnosis (CCD) are applied to 1H magnetic resonance (MR) spectra of astrocytomas, meningiomas, and epileptic brain tissue. The MR spectra (360 MHz, 37 degrees C) of tissue specimens (biopsies) from subjects with meningiomas (95; 26 cases), astrocytomas (74; 26 cases), and epilepsy (37; 8 cases) were preprocessed by several methods. Each data set was partitioned into training and validation sets. Robust classification was carried out via linear discriminant analysis (LDA), artificial neural nets (NN), and CCD, and the results were compared with histopathological diagnosis of the MR specimens. Normalization of the relevant spectral regions affects classification accuracy significantly. The spectra-based average three-class classification accuracies of LDA and NN increased from 81.7% (unnormalized data sets) to 89.9% (normalized). CCD increased the classification accuracy of the normalized sets to an average of 91.8%. CCD invariably decreases the fraction of unclassifiable spectra. The same trends prevail, with improved results, for case-based classification. Preprocessing the 1H MR spectra is essential for accurate and reliable classification of astrocytomas, meningiomas, and nontumorous epileptic brain tissue. CCD improves classification accuracy, with an attendant decrease in the fraction of unclassifiable spectra or cases.

L16 ANSWER 40 OF 75 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1995:246743 BIOSIS
TI The **classification** of colon tissue as neoplastic versus normal by multivariate analysis of 1H magnetic resonance spectroscopy (1H MRS.
AU Bernstein, C. N. (1); Briere, K. M.; Pettigrew, N. M.; Lewin, K.; Kitchen, D. G.; **Somorjai, R. L.**; Smith, I. C. P.; Bezabeh, T.
CS (1) Dep. Med., Univ. Manitoba, Winnipeg, MB Canada
SO Gastroenterology, (1995) Vol. 108, No. 4 SUPPL., pp. A449. Meeting Info.: 95th Annual Meeting of the American Gastroenterological Association and Digestive Disease Week San Diego, California, USA May 14-17, 1995

L16 ANSWER 44 OF 75 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1994:273722 BIOSIS
TI Proton magnetic resonance and human thyroid neoplasia I: **Discrimination** between benign and malignant **neoplasms**.
AU Russell, Peter; Lean, Cynthia L.; Delbridge, Leigh; May, George L.; Dowd, Susan; Mountford, Carolyn E. (1)
CS (1) Membrane MR Unit, Dep. Cancer Med., Univ. Sydney, NSW 2006 Australia
SO American Journal of Medicine, (1994) Vol. 96, No. 4, pp. 383-388.
AB PURPOSE: Thyroid nodules are very common, yet the vast majority are biologically benign. The extreme difficulty facing the clinician selecting potentially malignant thyroid nodules for surgery was the subject of a recent editorial by Ernest L. Mazzaferri in the American Journal of Medicine (93:359-362, 1992). Here we evaluate the potential of proton magnetic resonance spectroscopy (1H MRS) to provide a solution to this problem. PATIENTS: Thyroid tissue from fifty-three patients undergoing partial or total thyroidectomy for solitary thyroid nodules were assessed by 1H MRS. RESULTS: When compared with the histologic diagnosis, 1H MRS distinguished normal thyroid tissue (n = 8) from invasive papillary (n = 9), anaplastic (n = 1), and medullary (n = 1) carcinomas with P values of lt 0.0001, based on altered cellular chemistry. The same magnetic resonance (MR) criteria categorized pathologically proven follicular carcinoma (n = 8) (established as such by the presence of capsular or vascular invasion at the periphery of the tumor, or by the presence of metastases in the patient) with the other thyroid cancers (P lt 0.0001). All other "benign" follicular neoplasms (n = 34), including five atypical follicular adenomas, were assessed by the same 1H MRS criteria and found to fit into one of the two above categories, viz. analogous to benign or malignant thyroid tissue. CONCLUSIONS: Proton MRS has the potential to separate out a group of truly benign follicular neoplasms from follicular tumors (both follicular adenomas and follicular carcinomas) that have an atypical follicular pattern on cytologic examination. This is the first report of an objective diagnostic procedure that has the potential to obviate surgical excision in a significant number of patients with benign follicular adenomas, independent of exhaustive histopathologic assessment.

L16 ANSWER 50 OF 75 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1993:254192 BIOSIS
TI In vitro characterization of lung **cancers** by the use of proton nuclear **magnetic resonance spectroscopy** of tissue extracts and **discriminant** factor analysis.
AU Hanaoka, Hideto (1); Ito, Yoshichika Ii Yoshiokachiro; Niitu, Katuhiro; Yasuda, Naoki
CS (1) Dep. Radiol., Sch. Med., Kyorin Univ., 6-20-2 Shinkawa, Mitaka, Tokyo 181 Japan
SO Magnetic Resonance in Medicine, (1993) Vol. 29, No. 4, pp. 436-440.
AB Using proton magnetic resonance spectroscopy (1H MRS) spectra were obtained in vitro from extracts of four types of lung cancer (squamous cell,

adenocarcinoma, large cell, small cell) and normal lung. The hydrophilic phase of the chloroform/methanol-water extracts yielded several distinct peaks. Among them the peak areas for cholines, creatines, glycine, and alanine, and their ratios were calculated and used as parameters to characterize different lung tissues. The ratios, choline/alanine and glycine/alanine, were significantly (P lt 0.001 to P lt 0.05) higher for the normal lung than lung cancers. Creatines/glycine and creatines/cholines generally provided good discrimination (P lt 0.001 to P lt 0.05) between any two types of lung cancer. When data were further analyzed by discriminant factor analysis, there was 81.5 to 90.7% accuracy in predicting between normal lung and each cancer type, or among the four types of lung cancer. These results suggested that 1H MRS might be useful as an adjunct modality in the differential diagnosis of lung cancers.

L16 ANSWER 60 OF 75 BIOSIS COPYRIGHT 2003 BIOLOGICAL ABSTRACTS INC.
AN 1988:283360 BIOSIS
TI NONLINEAR METHODS FOR **DISCRIMINATION** AND THEIR APPLICATION TO **CLASSIFICATION** OF PROTEIN STRUCTURES.
AU KLEIN P; **SOMORJAI R L**
CS DIV. BIOLOGICAL SCI., NATL. RES. COUNCIL CANADA, OTTAWA, ONTARIO, CANADA K1A 0R6.
SO J THEOR BIOL, (1988) 130 (4), 461-468.
AB Discriminant analysis assigns objects to one of several classes on the basis of attributes which characterize the objects. The success of classification depends on the selection of discriminatory attributes and on the choice of an assignment rule. In this paper we focus on the latter and discuss ways to obtain nonlinear classification rules through maximum likelihood, canonical components and projection pursuit. We use both linear and nonlinear methods to classify proteins into three secondary structural types: alpha, beta, and mixed alpha and beta or irregular. Using simple attributes, dependent on amino acid properties, we show that the rate of incorrect classification can be decreased by more than 15% when nonlinear methods are used.

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